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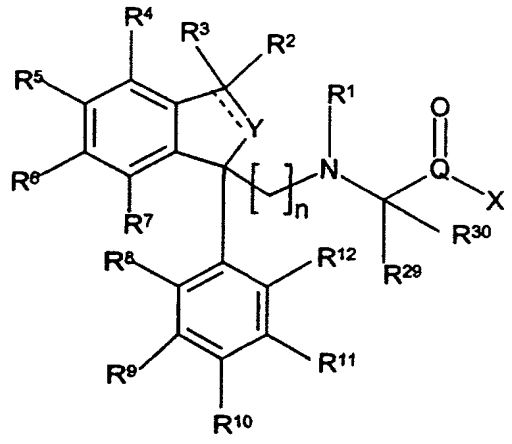
(54) Title: NOVEL COMPOUNDS AND THEIR USE AS GLYCINE TRANSPORT INHIBITORS



(I)

(57) Abstract: The invention provides novel compounds of the formula I below: (I), wherein the meaning of each substituent is defined in the application. The compounds are useful as inhibitors of the glycine transporter and useful in the treatment of diseases responsive to the inhibition of the glycine transporter. The invention provides a pharmaceutical composition comprising a compound of Formula I as defined above and the use of compounds as above for the manufacture of medicaments for treatment of diseases responsive to ligands of the glycine transporter.

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Novel compounds and their use as glycine transport inhibitors

The present invention provides novel compounds of the general formula I, and their use as glycine transport inhibitors.

Background of the invention

Glutamic acid is the major excitatory amino acid in the mammalian central nervous system (CNS), and acts through two classes of receptors, the ionotropic and metabotrobic receptors, respectively. The ionotropic glutamate receptors are divided into three subtypes based on the affinities of agonists for these receptors, namely *N*-methyl-D-aspartate (NMDA), (*R*,*S*)-2-amino-3-(3-hydroxy-5-methylisoxazol-4-yl)propanoic acid (AMPA) and kainic acid (or kainate) receptors.

The NMDA receptor contains binding sites for modulatory compounds such as glycine and polyamines. Binding of glycine to its receptor enhances the NMDA receptor activation. Such NMDA receptor activation may be a potential target for the treatment of schizophrenia and other diseases linked to NMDA receptor dysfunction. An activation can be achieved by an inhibitor of the glycine transporter.

Molecular cloning has revealed the existence of two types of glycine receptors, GlyT-1 and GlyT-2, wherein GlyT-1 can be further subdivided into GlyT-1a, GlyT-1b and GlyT-1c.

The NMDA receptor is blocked by compounds such as phencyclidine which induce a psychotic state which resembles schizophrenia. Likewise, the NMDA antagonists, such as ketamine, induce negative and cognitive symptoms similar to schizophrenia. This indicates that NMDA receptor dysfunction is involved in the pathophysiology of schizophrenia.

The NMDA receptor has been associated with a number of diseases, such as pain (Yaksh *Pain* **1989**, 37, 111-123), spasticity, myuoclonus and epilepsy (Truong et. al. *Movement Disorders* **1988**, 3, 77-87), learning and memory (Rison et. al. *Neurosci. Biobehav. Rev.* **1995**, 19, 533-552,).

Thus, glycine transporter antagonistists or inhibitors are believed to be highly beneficial in the treatment of schizophrenia, including both the positive and the negative symptoms of schizophrenia, other psychoses, dementia, and improving cognition in conditions where the cognitive processes are diminished, i.e. Alzheimer's disease, multi-infarct dementia, AIDS

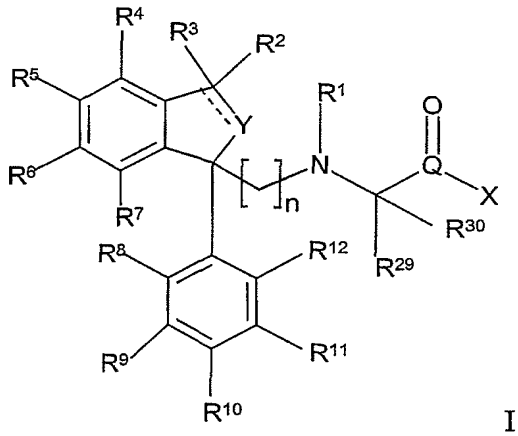
dementia, Huntington's disease, Parkinson's disease, amyotrophic lateral sclerosis or diseases wherein the brain is damaged by inner or outer influence, such as trauma to the head or stroke.

Clinical trials with glycine have been reported (Javitt et. al. *Am. J. Psychiatry* **1994**, 151, 1234-1236), (Leiderman et. al. *Biol. Psychiatry* **1996**, 39, 213-215). The treatment with high-dose glycine is reported to improve the symptoms of schizophrenia. There is a need for more efficient compounds as ligands for the glycin transporter for the treatment of NMDA associated diseases.

The compounds of the present invention are potent ligands for the glycine transporter.

Summary of the invention

The invention provides novel compounds of the formula I below:



I

wherein

R^1 represents hydrogen, C_{1-6}-alkyl, cycloalkyl or cycloalkylalkyl;

R^2 and R^3 independently represent hydrogen, halogen, C_{1-6}-alkyl, C_{3-8} cycloalkyl or C_{3-8} cycloalkyl-C_{1-6}-alkyl or R^2 and R^3 together form a C_{3-8}-cycloalkyl;

R^4, R^5, R^6 and R^7 independently represent hydrogen, halogen, CF_3, NO_2, CN, C_{1-6} alkyl, C_{2-6} alkenyl, C_{2-6} alkynyl, C_{3-8} cycloalkyl, C_{1-6} alkoxy, C_{1-6} alkylthio, OH, SH, $NR^{14}R^{15}$, wherein R^{14} and R^{15} independently represent hydrogen or C_{1-6}-alkyl; $-COR^{16}$ wherein R^{16} represents OH, C_{1-6}-alkyl, C_{1-6}-alkoxy, $NR^{17}R^{18}$, wherein R^{17} and R^{18} independently represent hydrogen or C_{1-6}-alkyl; aryl or heteroaryl, wherein aryl and heteroaryl are optionally substituted one or more

times with halogen, CF_3, OCF_3, CN, NO_2, C_{1-6} alkyl, C_{2-6} alkenyl, C_{2-6} alkynyl, C_{3-8} cycloalkyl, C_{1-6} alkoxy, C_{1-6} thioalkyl, OH, SH or $NR^{24}R^{25}$, wherein R^{24} and R^{25} independently represent hydrogen or C_{1-6}-alkyl;

or R^4 and R^5, or R^5 and R^6, or R^6, and R^7 together form a fused, aromatic, saturated or partly saturated ring which optionally contains one or more heteroatoms such as O, N or S;

R^8, R^9, R^{10}, R^{11} and R^{12} independently represent hydrogen, halogen, CF_3, OCF_3, CN, NO_2, C_{1-6} alkyl, C_{2-6} alkenyl, C_{2-6} alkynyl, C_{3-8} cycloalkyl, C_{1-6} alkoxy, C_{1-6}-alkylthio, OH, SH, $NR^{19}R^{20}$, wherein R^{19} and R^{20} independently represent hydrogen or C_{1-6}-alkyl; or R^8, R^9, R^{10}, R^{11} and R^{12} independently represent -COR^{21}, wherein R^{21} represents OH, C_{1-6}-alkoxy, $NR^{22}R^{23}$, wherein R^{22} and R^{23} independently represent hydrogen or C_{1-6}-alkyl; or R^8, R^9, R^{10}, R^{11}, and R^{12} independently represent aryl or heteroaryl, wherein aryl and heteroaryl are optionally substituted one or more times with halogen, CF_3, OCF_3, CN, NO_2, C_{1-6} alkyl, C_{2-6} alkenyl, C_{2-6} alkynyl, C_{3-8} cycloalkyl, C_{1-6} alkoxy, C_{1-6} alkythio, OH, SH, COR^{26}, wherein R^{26} represents OH, C_{1-6} alkoxy or C_{1-6} alkyl; or $NR^{30}R^{31}$, wherein R^{30} and R^{31} independently represent hydrogen or C_{1-6}-alkyl;

R^8 and R^9, or R^9 and R^{10}, or R^{10} and R^{11}, or R^{11} and R^{12} together form a fused, aromatic, saturated or partly saturated ring which optionally contains one or more heteroatoms such as O, N, or S;

Y is O, S, CH_2 or CH, and when Y is CH then the dotted line is a bond;

n is 2, 3, 4, 5 or 6;

Q represents C, P-OR^{29}, or S=O, wherein R^{29} represents hydrogen or C_{1-6}-alkyl;

X is OR^{13} or $NR^{27}R^{28}$, wherein R^{13}, R^{27}, and R^{28} independently represent hydrogen, C_{1-6}-alkyl, aryl or aryl-C_{1-6}-alkyl, wherein aryl may be substituted with halogen, CF_3, OCF_3, CN, NO_2, or C_{1-6} alkyl; optionally R^{27} and R^{28} together form a ring which may contain further nitrogen, oxygen or sulfur atoms and the ring may optionally be partly saturated;

R^{29} and R^{30} represent hydrogen, C_{1-6}-alkyl, cycloalkyl or cycloalkylalkyl

or a pharmaceutically acceptable addition salt thereof;

The compounds are useful as inhibitors of the glycine transporter and useful in treatment of diseases responsive to the inhibition of the glycine transporter.

Detailed description of the invention

In a preferred embodiment of the invention, Q is C;

Other preferred embodiments are wherein n is 2 or 3;

Another preferred embodiment is wherein R^1 is CH_3;

Yet another preferred embodiment is wherein X is OH or C_{1-6}-alkoxy; more preferred is wherein X is OH, OCH_3 or OC_2H_5

Other preferred embodiments are wherein R^7 represent hydrogen, and R^4, R^5 or R^6 represent hydrogen, CN, halogen, C_{1-6}-alkyl, CF_3 or phenyl optionally substituted one or more times with halogen, C_{1-6}-alkyl, C_{1-6}-alkoxy, CF_3, or R^4, R^5 or R^6 represent heteroaryl optionally substituted one or more times with halogen, or wherein R^4 and R^5 or R^5 and R^6 together form a fused aryl;

Another preferred embodiment of the invention is wherein R^8, R^9, R^{10}, R^{11} or R^{12} independently represent hydrogen, halogen, C_{1-6}-alkyl, C_{1-6}-alkoxy, or R^8 and R^9 or R^9 and R^{10} together form a fused aryl;

In an more preferred embodiment, one or two of R^8, R^9, R^{10}, R^{11} or R^{12} represent halogen, C_{1-6}-alkyl, CF_3 or C_{1-6}-alkoxy;

In a more preferred embodiment of the invention R^4, R^6, R^7, R^8, R^9 and R^{12} are all hydrogen and R^5 represents halogen, CF_3, CN, C_{1-6} alkyl, C_{1-6} alkoxy or $-COR^{16}$, wherein R^{16} represents C_{1-6}-alkyl; and R^{10} and R^{11} represent hydrogen, halogen, CF_3, or CN, provided that at least one of R^{10} and R^{11} is not hydrogen;

R^{29} and R^{30} independently represent hydrogen or C_{1-6}-alkyl or R^2 and R^3 together form a C_{3-8}-cycloalkyl;

Another preferred embodiment of the invention is wherein the compounds are the following

N-{3-[5-Cyano-1-(4-fluorophenyl)-1,3-dihydroisobenzofuran-1-yl]-1-propyl}glycine ethyl ester,

N-{3-[5-Cyano-1-(4-fluorophenyl)-1,3-dihydroisobenzofuran-1-yl]-1-propyl}-N-methylglycine ethyl ester,

N-{3-[5-Cyano-1-(4-fluorophenyl)-1,3-dihydroisobenzofuran-1-yl]-1-propyl}glycine,

N-{3-[5-Cyano-1-(4-fluorophenyl)-1,3-dihydroisobenzofuran-1-yl]-1-propyl}-N-methylglycine,

N-{3-[1-(3-chlorophenyl)-1,3-dihydroisobenzofuran-1-yl]-1-propyl}-N-methylglycine,

N-{3-[1-(3-trifluoromethylphenyl)-1,3-dihydroisobenzofuran-1-yl]-1-propyl}-N-methylglycine,

N-{3-[1-(3-trifluoromethylphenyl)-1,3-dihydroisobenzofuran-1-yl]-1-propyl}-N-methyl (1-ethyl)glycine,

N-{3-[1-(4-methylphenyl)-1,3-dihydroisobenzofuran-1-yl]-1-propyl}-N-methylglycine,

N-{3-[1-(4-fluorophenyl)-1,3-dihydroisobenzofuran-1-yl]-1-propyl}-N-methylglycine,

N-{3-[1-(4-fluorophenyl)-1,3-dihydroisobenzofuran-1-yl]-1-propyl}-N-methylalanine,

N-{3-[1-(4-fluorophenyl)-1,3-dihydroisobenzofuran-1-yl]-1-propyl}-N-methyl (1-ethyl)glycine,

N-{3-[4-chloro-1-(3-methyl-4-fluorophenyl)-1,3-dihydroisobenzofuran-1-yl]-1-propyl}-N-methylglycine,

N-{3-[4-chloro-1-(4-chlorophenyl)-1,3-dihydroisobenzofuran-1-yl]-1-propyl}-N-methylglycine,

N-{3-[5-chloro-1-(4-chlorophenyl)-1,3-dihydroisobenzofuran-1-yl]-1-propyl}-N-methylalanine,

N-{3-[6-chloro-1-(3-methyl-4-fluorophenyl)-1,3-dihydroisobenzofuran-1-yl]-1-propyl}-N-methylglycine,

N-{3-[6-chloro-1-(4-chlorophenyl)-1,3-dihydroisobenzofuran-1-yl]-1-propyl}-N-methylglycine,

N-{3-[6-chloro-1-(4-methylphenyl)-1,3-dihydroisobenzofuran-1-yl]-1-propyl}-N-methylglycine,

N-{3-[6-chloro-1-(4-methoxyphenyl)-1,3-dihydroisobenzofuran-1-yl]-1-propyl}-N-methylglycine,

N-{3-[5-fluoro-1-(4-chlorophenyl)-1,3-dihydroisobenzofuran-1-yl]-1-propyl}-N-methylglycine,

N-{3-[5-fluoro-1-(4-methoxyphenyl)-1,3-dihydroisobenzofuran-1-yl]-1-propyl}-N-methylglycine,

N-{3-[5-trifluoromethyl-1-(4-fluorophenyl)-1,3-dihydroisobenzofuran-1-yl]-1-propyl}-N-methylglycine,

N-{3-[5-trifluoromethyl-1-(4-fluorophenyl)-1,3-dihydroisobenzofuran-1-yl]-1-propyl}-N-methylalanine,

N-{3-[5-cyano-1-(3-methyl-4-fluorophenyl)-1,3-dihydroisobenzofuran-1-yl]-1-propyl}-N-methylglycine,

N-{3-[5-cyano-1-(4-cyanophenyl)-1,3-dihydroisobenzofuran-1-yl]-1-propyl}-N-methylalanine,

N-{3-[5-cyano-1-(4-methoxyphenyl)-1,3-dihydroisobenzofuran-1-yl]-1-propyl}-N-methylglycine,

N-{3-[5-cyano-1-(4-fluorophenyl)-1,3-dihydroisobenzofuran-1-yl]-1-propyl}-N-methylglycine, N-{2-[5-cyano-1-(4-fluorophenyl)-1,3-dihydroisobenzofuran-1-yl]ethyl}-N-methylglycine,

N-{3-[5-Chloro-1-(4-chloro-phenyl)-indan-1-yl]-propyl}-N-methylglycine,

N-{3-[5-Chloro-1-(4-chloro-phenyl)-indan-1-yl]-propyl}-N-methylalanine,

N-{3-[3-cyclo-1-(4-methylphenyl)-1,3-dihydroisobenzofuran-1-yl]-1-propyl}-N-methylglycine,

N-[3-(3,3-Dimethyl-1-phenyl-1,3-dihydro-benzo[*c*]thiophen-1-yl)-propyl]-N-methylglycine,

N-[3-(3,3-Dimethyl-1-phenyl-1,3-dihydro-benzo[*c*]thiophen-1-yl)-propyl]-N-methylalanine,

N-{3-[1-(4-Fluoro-phenyl)-3,3-dimethyl-1,3-dihydro-isobenzofuran-1-yl]-propyl}-N-methylglycine,

N-{3-[5-Bromo-1-(4-chlorophenyl)-1,3-dihydroisobenzofuran-1-yl]-1-propyl}-N-methylglycine,

N-{2-[1-(4-Chloro-phenyl)-3,3-dimethyl-1,3-dihydro-isobenzofuran-1-yl]-ethyl}-N-methylglycine,

N-[3-(3-methyl-1-phenyl-1*H*-inden-1-yl)-propyl]-N-methylglycine,

N-[3-(5-Chloro-1-thiophen-2-yl-1,3-dihydro-isobenzofuran-1-yl)-propyl]-N-methylglycine,

N-[3-(5-Chloro-1-thiophen-2-yl-1,3-dihydro-isobenzofuran-1-yl)-propyl]-N-methyl (1-ethyl)-glycine,

N-[3-(3-methyl-1-phenyl-1,3-dihydro-isobenzofuran-1-yl)-propyl]-N-methylalanine,

N-[3-(3-methyl-1-phenyl-1,3-dihydro-isobenzofuran-1-yl)-propyl]-N-methyl (1-ethyl)-glycine,

N-[3-(3,3-Dimethyl-1-phenyl-1,3-dihydro-isobenzofuran-1-yl)-ethyl]-N-methylalanine,

N-[3-(3,3-Dimethyl-1-(4-fluoro-phenyl)-1,3-dihydro-isobenzofuran-1-yl)-ethyl]-N-methylalanine,

N-[3-(3,3-Dimethyl-1-phenyl-1,3-dihydro-isobenzofuran-1-yl)-ethyl]-N-methyl-(1-ethyl)glycine,

N-[3-(3,3-Dimethyl-1-(4-fluoro-phenyl)-1,3-dihydro-isobenzofuran-1-yl)-ethyl]-N-methyl-(1-ethyl)glycine,

N-[3-(3,3-Diethyl-1-phenyl-1,3-dihydro-isobenzofuran-1-yl)-propyl]-N-methylalanine,

N-[3-(3,3-Diethyl-1-(4-chloro-phenyl)-1,3-dihydro-isobenzofuran-1-yl)-propyl]-N-methylalanine,

N-[3-(3,3-Diethyl-1-(4-chloro-phenyl)-1,3-dihydro-isobenzofuran-1-yl)-propyl]-N-methylglycine,

N-[3-(1-phenyl-1,3-dihydro-benzo[*c*]thiophen-1-yl)-propyl]-N-methylalanine,

N-{3-[1-(4-Chloro-phenyl)-3,3-dimethyl-indan-1-yl]-propyl}-N-methylglycine,

N-{3-[1-(4-Chloro-phenyl)-3,3-diethyl-1,3-dihydro-isobenzofuran-1-yl]-propyl}-N-methyl-alanine,

N-[2-(3-methyl-1-phenyl-indan-1-yl)-ethyl]-amino}-N-methyl alanine,

N-[3-(1-phenyl-(1*H*)-inden-1-yl)-propyl]-N-methyl-alanine,

N-{3-[1-(4-Fluoro-phenyl)-5-(4-trifluoromethyl-phenyl)-1,3-dihydro-isobenzofuran-1-yl]-propyl}-N-methyl-glycine,

N-{3-[5-Chloro-1-(4-chloro-phenyl)-indan-1-yl]-propyl}-N-methyl-glycine,

N-{3-[5-Chloro-1-(4-chloro-phenyl)-indan-1-yl]-propyl}-N-methyl-alanine,

N-{3-[1-(4-chloro-phenyl)-5-(4-trifluoromethyl-phenyl)-1,3-dihydro-isobenzofuran-1-yl]-ethyl}-N-methyl-glycine,

N-{3-[1-(4-Chloro-phenyl)-5-(4-methyl-phenyl)-1,3-dihydro-isobenzofuran-1-yl]-ethyl}-N-methyl-glycine,

N-{3-[1-(4-Chloro-phenyl)-5-(4-methoxy-phenyl)-1,3-dihydro-isobenzofuran-1-yl]-ethyl}-N-methyl-glycine,

N-{3-[1-(4-Chloro-phenyl)-5-(2-thiophenyl)-1,3-dihydro-isobenzofuran-1-yl]-ethyl}-N-methyl-glycine,

N-{3-[1-(4-Chloro-phenyl)-5-(4-methyl-phenyl)-1,3-dihydro-isobenzofuran-1-yl]-propyl}-N-methyl-glycine,

N-{3-[1-(4-Chloro-phenyl)-5-(4-methoxy-phenyl)-1,3-dihydro-isobenzofuran-1-yl]-propyl}-N-methyl-glycine,

N-{3-[1-(4-chloro-phenyl)-5-(4-trifluoromethyl-phenyl)-1,3-dihydro-isobenzofuran-1-yl]-propyl}-N-methyl-glycine,

N-{3-[1-(4-Chloro-phenyl)-5-(4-chloro-phenyl)-1,3-dihydro-isobenzofuran-1-yl]-ethyl}-N-methyl-glycine,

N-{2-[1-(4-Chloro-phenyl)-5-(5-chloro-thiophen-2-yl)-1,3-dihydro-isobenzofuran-1-yl]-ethyl}-N-methyl-glycine,

N-{3-[1-(4-Chloro-phenyl)-5-(3-methyl-phenyl)-1,3-dihydro-isobenzofuran-1-yl]-ethyl}-N-methyl-glycine,

N-{3-[1-(4-Chloro-phenyl)-5-(2-methyl-phenyl)-1,3-dihydro-isobenzofuran-1-yl]-ethyl}-N-methyl-glycine,

N-{3-[1-(4-Chloro-phenyl)-5-(2,5-dichloro-phenyl)-1,3-dihydro-isobenzofuran-1-yl]-ethyl}-N-methyl-glycine,

N-{3-[1-(4-chloro-phenyl)-5-(3-trifluoromethyl-phenyl)-1,3-dihydro-isobenzofuran-1-yl]-ethyl}-N-methyl-glycine,

N-{3-[1-(4-chloro-phenyl)-5-(3-trifluoromethyl-phenyl)-1,3-dihydro-isobenzofuran-1-yl]-propyl}-N-methyl-glycine ,

N-{3-[1-(4-Chloro-phenyl)-5-(3,4-dichloro-phenyl)-1,3-dihydro-isobenzofuran-1-yl]-ethyl}-N-methyl-glycine,

N-{3-[1-(4-Chloro-phenyl)-5-(4-chloro-phenyl)-1,3-dihydro-isobenzofuran-1-yl]-propyl}-N-methyl-glycine,

N-{3-[1-(4-Chloro-phenyl)-5-(3-methyl-phenyl)-1,3-dihydro-isobenzofuran-1-yl]-propyl}-N-methyl-glycine,

N-{3-[1-(4-Chloro-phenyl)-5-(2-methyl-phenyl)-1,3-dihydro-isobenzofuran-1-yl]-propyl}-N-methyl-glycine,

N-{3-[1-(4-Chloro-phenyl)-5-(2,5-dichloro-phenyl)-1,3-dihydro-isobenzofuran-1-yl]-propyl}-N-methyl-glycine,

N-{3-[1-(4-Chloro-phenyl)-5-(3,4-dichloro-phenyl)-1,3-dihydro-isobenzofuran-1-yl]-propyl}-N-methyl-glycine,

N-{3-[1-(4-chloro-phenyl)-5-(2-trifluoromethyl-phenyl)-1,3-dihydro-isobenzofuran-1-yl]-propyl}-N-methyl-glycine ,

or a pharmaceutically acceptable addition salt thereof.

The invention provides a pharmaceutical composition comprising at least one compound of Formula I as defined above or a pharmaceutically acceptable acid addition salt thereof in a therapeutically effective amount and in combination with one or more pharmaceutically acceptable carriers or diluents.

The invention also provides the use of compounds as above for the manufacture of medicaments for treatment of diseases responsive to ligands of the glycine transporter.

The invention provides a method for treatment of diseases responsive to ligands of the glycine transporter.

In preferred embodiments of the invention, the ligands are antagonists of the glycine transporter.

Pharmaceutically acceptable addition salts are those which form pharmcological acceptable anions such as maleic, fumaric, benzoic, ascorbic, succinic, oxalic, bis-methylenesalicylic, methanesulfonic, ethanedisulfonic, acetic, propionic, tartaric, salicylic, citric, gluconic, lactic, malic, mandelic, cinnamic, citraconic, aspartic, stearic, palmitic, itaconic, glycolic, p-aminobenzoic, glutamic, benzenesulfonic and theophylline acetic acids, as well as the 8-halotheophyllines, for example 8-bromotheophylline. Exemplary of such inorganic salts are those with hydrochloric, hydrobromic, sulfuric, sulfamic, phosphoric and nitric acids.

The compound of the invention may be administered in any suitable way such as orally or parenterally, and it may be presented in any suitable form for such administration, for example in the form of tablets, capsules, powders, syrups or solutions or dispersions for injection. Preferably, and in accordance with the purpose of the present invention, the compound of the invention is administered in the form of a solid pharmaceutical entity, suitably as a tablet or a capsule or in the form of a suspension, solution or dispersion for injection.

Methods for the preparation of solid pharmaceutical preparations are well known in the art. Tablets may thus be prepared by mixing the active ingredients with ordinary adjuvants and/or diluents and subsequently compressing the mixture in a convenient tabletting machine. Examples of adjuvants or diluents comprise: corn starch, lactose, talcum, magnesium stearate, gelatine, lactose, gums, and the like. Any other adjuvant or additive such as colourings, aroma, preservatives, etc. may also be used provided that they are compatible with the active ingredients.

Furthermore, the compounds of this invention may exist in unsolvated as well as in solvated forms with pharmaceutically acceptable solvents such as water, ethanol, and the like. In general, the solvated forms are considered equivalent to the unsolvated forms for the purposes of this invention.

Some of the compounds of the present invention contain chiral centres and such compounds exist in the form of isomers (e.g. enantiomers). The invention includes all such isomers and any mixtures thereof including racemic mixtures.

Racemic forms can be resolved into the optical antipodes by known methods, for example by separation of diastereomeric salts thereof with an optically active acid and liberating the optically active amine compound by treatment with a base. Another method for resolving racemates into the optical antipodes is based upon chromatography on an optically active matrix. Racemic compounds of the present invention can thus be resolved into their optical antipodes, e.g. by fractional crystallisation of d- or l- (tartrates, mandelates or

camphorsulphonate) salts for example. The compounds of the present invention may also be resolved by the formation of diastereomeric derivatives.

Additional methods for the resolution of optical isomers, known to those skilled in the art, may be used. Such methods include those discussed by J. Jaques, A. Collet, and S. Wilen in "Enantiomers, Racemates, and Resolutions", John Wiley and Sons, New York (1981).

Optically active compounds can also be prepared from optically active starting materials.

Definition of substituents

Halogen means fluoro, chloro, bromo or iodo. Preferred halogens are F and Cl.

The term C_{1-6}-alkyl refers to a branched or unbranched alkyl group having from one to six carbon atoms inclusive, such as methyl, ethyl, 1-propyl, 2-propyl, 1-butyl, 2-butyl, 2-methyl-2-propyl and 2-methyl-1-propyl. Preferred alkyls are methyl and ethyl.

Similarly, C_{2-6}-alkenyl and C_{2-6}-alkynyl, respectively, designate such groups having from two to six carbon atoms, including one double bond and triple bond respectively, such as ethenyl, propenyl, butenyl, ethynyl, propynyl, and butynyl.

The term C_{3-8}-cycloalkyl designates a monocyclic or bicyclic carbocycle having three to eight C-atoms, such as cyclopropyl, cyclopentyl, cyclohexyl, etc.

The term C_{3-8}-cycloalkylalkyl designates a cycloalkyl as defined above and an alkyl as above.

The terms C_{1-6}-alkoxy and C_{1-6}-alkylthio designate such groups in which the alkyl group is C_{1-6}-alkyl as defined above.

The term aryl designates an aromatic hydrocarbon such as phenyl or naphtyl.

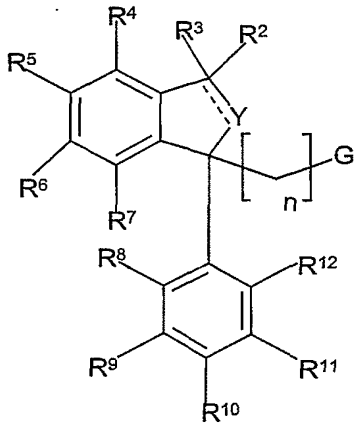
The term heteroaryl refers to a mono- or bicyclic heterocyclic aromatic group containing at least one N, S or O atom, such as furyl, pyrrolyl, thienyl, oxazolyl, isoxazolyl, thiazolyl, isothiazolyl, imidazolyl, pyridyl, pyrimidyl, tetrazolyl, benzofuranyl, benzothienyl, benzimidazolyl, indolyl. Preferred heteroaryls are monocyclic heteroaryls. Especially preferred is thienyl.

Preparatory examples

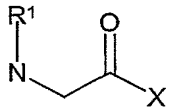
The compounds of the invention may be prepared as follows:

1) alkylating an amine of formula II with an alkylating agent of formula I

G is a suitable leaving group such as e.g. halogen or mesylate.



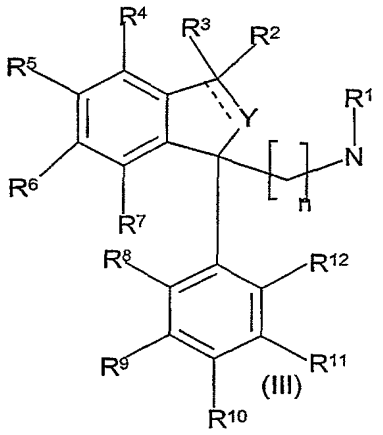
(I)



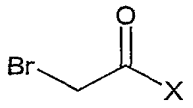
(II)

the substituents R^1-R^{12}, n, Y and X are as defined above;

2) alkylating an amine of formula III with an alkylating agent of formula IV



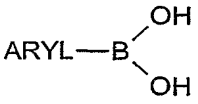
(III)



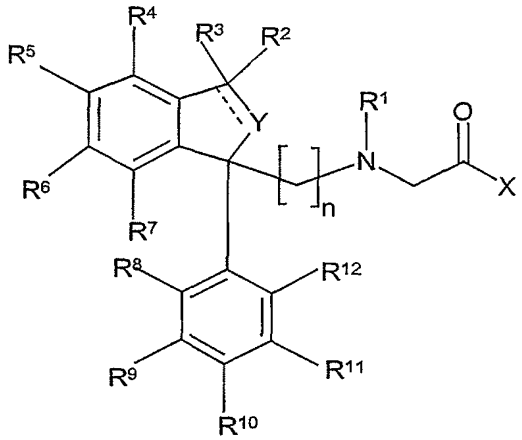
(IV)

wherein the substituents R^1-R^{12}, n, Y and X are as defined above;

3) Coupling of an aryl subsitituent of formula VI to the aryl bromide derivative of formula V wherein the substituents R^4-R^7 are halogens, R^1-R^3 and R^8-R^{12}, n, Y and X are as defined above

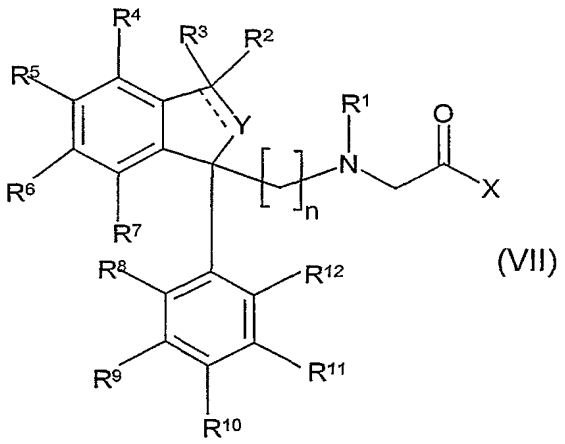


(VI)



(V)

4) hydrolysing the ester group of a compound of formula VII to obtain the corresponding carboxylic acid derivative



(VII)

the substituents R^1-R^{12}, n, and Y are as defined above and X is OH in the final product.

The alkylations according to methods 1 and 2 are conveniently carried out in an inert solvent such as a suitably boiling alcohol or ketone or in tetrahydrofuran, preferably in the presence of an organic or inorganic base (potassium carbonate, diisopropylethylamine or triethylamine) at reflux temperature. Alternatively, the alkylation can be performed at a fixed temperature which is different from the boiling point in one of the above-mentioned solvents or in dimethylformamide, dimethylsulfoxide or N-methylpyrrolidin-2-one, preferably in the presence of a base.

Reagents of formula I are prepared by methods described in the literature, see. e.g. US 3,549,656 , GB 1166711 and Dykstra et al. *J. Med. Chem.* **1967**, 10(3), 418-28.

Glycine derivatives of formula II are well described in the literature.

Amines of formula III are prepared as described by Bigler et. al. *Eur. J. Med. Chem.* **1977**, 12, 289.

Biaryl derivatives of formula IV are prepared by suzuki type coupling of an aryl boronic acid with the desired halide in dimethoxyethane,tetrahydrofuran or toluene containing an inorganic base such as sodium carbonate and a palladium catalyst at a temperature between room temperature and the boiling point of the solvent.

The hydrolysis according to method 4 is conveniently performed in a suitably boiling alcohol in the presence of an aqueous base such as e.g. sodium hydroxide at ambient temperature. The starting materials of formula V are prepared by methods 1 or 2.

Experimental

Melting points were determined on a Büchi SMP-20 apparatus and are uncorrected. Analytical LC-MS data were obtained on a PE Sciex API 150EX instrument equipped with IonSpray source and Shimadzu LC-8A/SLC-10A LC system. The LC conditions (50 X 4.6 mm YMC ODS-A with 5 μm particle size) were linear gradient elution with water/acetonitrile/trifluoroacetic acid (90:10:0.05) to water/acetonitrile/trifluoroacetic acid (10:90:0.03) in 7 min at 2 mL/min. Purity was determined by integration of the UV trace (254 nm). The retention times, R_t, are expressed in minutes.

Mass spectra were obtained by an alternating scan method to give molecular weight information. The molecular ion, MH+, was obtained at low orifice voltage (5-20V) and fragmentation at high orifice voltage (100V).

Preparative LC-MS-separation was performed on the same instrument. The LC conditions (50 X 20 mm YMC ODS-A with 5 μm particle size) were linear gradient elution with water/acetonitrile/trifluoroacetic acid (80:20:0.05) to water/acetonitrile/trifluoroacetic acid (10:90:0.03) in 7 min at 22.7 mL/min. Fraction collection was performed by split-flow MS detection.

^{1}H NMR spectra were recorded at 500.13 MHz on a Bruker Avance DRX500 instrument or at 250.13 MHz on a Bruker AC 250 instrument. Deuterated chloroform (99.8%D) or dimethyl sulfoxide (99.9%D) were used as solvents. TMS was used as internal reference standard. Chemical shift values are expressed in ppm-values. The following abbreviations are used for multiplicity of NMR signals: s=singlet, d=doublet, t=triplet, q=quartet, qui=quintet, h=heptet, dd=double doublet, dt=double triplet, dq=double quartet, tt=triplet of triplets, m=multiplet, b=broad singlet. NMR signals corresponding to acidic protons are generally omitted. Content of water in crystalline compounds was determined by Karl Fischer titration. Standard workup procedures refer to extraction with the indicated organic solvent from proper aqueous solutions, drying of combined organic extracts (anhydrous $MgSO_4$ or Na_2SO_4), filtering and evaporation of the solvent *in vacuo*. For column chromatography, silica gel of type Kieselgel 60, 230-400 mesh ASTM was used. For ion-exchange chromatography, SCX, 1 g, Varian Mega Bond Elut®, Chrompack cat. No. 220776 was used. Prior use of the SCX-columns was pre-conditioned with 10 % solution of acetic acid in methanol (3 mL).

The following examples will illustrate the invention further. They are, however, not to be construed as limiting.**Example 1**

1a, N-(3-(5-Cyano-1-(4-fluorophenyl)-1,3-dihydroisobenzofuran-1-yl)-1-propyl)glycine.ethyl ester.

A stirred mixture of 3-(5-cyano-1-(4-fluorophenyl)-1,3-dihydroisobenzofuran-1-yl)-1-propyl amine (1.5 g), potassium carbonate (1.3 g) and ethanol (15 mL) was treated dropwise with a solution of ethyl bromoacetate (0.75 g) in ethanol (15 mL) at room temperature. After reflux for 1.5 h, the mixture was cooled and concentrated *in vacuo*. Standard work-up with ethyl acetate gave an oil which was purified by flash chromatography (eluent heptane/ethyl acetate/triethylamine 26:70:4). The title compound was obtained as a clear oil (0.77 g).
LC/MS (m/z) 383 (MH+), purity (UV): >99%.

Example 2

2a, N-(3-(5-Cyano-1-(4-fluorophenyl)-1,3-dihydroisobenzofuran-1-yl)-1-propyl)-N-methylglycine.ethyl ester.

A stirred mixture of 3-(5-cyano-1-(4-fluorophenyl)-1,3-dihydroisobenzofuran-1-yl)-1-propyl iodide (3.1 g), ethyl N-methylglycinate (4.4 g) and diethylisopropylamine (4.4 g) in tetrahydrofuran (50 mL) was refluxed for 16 h. Standard work-up with ethyl acetate gave an oil which was purified by flash chromatography (eluent heptane/ethyl acetate/triethylamine 64:32:4) giving the title compound as a clear oil (1.4 g).
LC/MS (m/z) 397 (MH+), purity (UV): >99%

Example 3

3a, N-(3-(5-Cyano-1-(4-fluorophenyl)-1,3-dihydroisobenzofuran-1-yl)-1-propyl)glycine hydrochloride

A mixture of N-(3-(5-cyano-1-(4-fluorophenyl)-1,3-dihydroisobenzofuran-1-yl)-1-propyl)glycineethyl ester (0.7 g), methanol (6 mL) and 6 M sodium hydroxide (2 mL) was

stirred at room temperature for 2 h. Adjustment of pH to < 6.5 with dilute hydrochloric acid followed by standard work-up with ethyl acetate gave the title compound as an oil (0.2 g).
LC/MS (m/z) 355 (MH+), purity (UV): >90%

In a similar manner, the following compound were prepared:

3b, N-(3-(5-Cyano-1-(4-fluorophenyl)-1,3-dihydroisobenzofuran-1-yl)-1-propyl)-N-methylglycine hydrochloride.
LC/MS (m/z) 369 (MH+), purity (UV): >90%

3c, Example 4:
N-{3-[1-(3-chlorophenyl)-1,3-dihydroisobenzofuran-1-yl]-1-propyl}-N-methylglycine hydrochloride
LC/MS (m/z) 360 (MH+), purity (UV 90%)

3d,Example 5:
N-{3-[1-(3-trifluoromethylphenyl)-1,3-dihydroisobenzofuran-1-yl]-1-propyl}-N-methylglycine hydrochloride.
LC/MS (m/z) 394 (MH+), purity (UV 79%)

3e,Example 6:
N-{3-[1-(3-trifluoromethylphenyl)-1,3-dihydroisobenzofuran-1-yl]-1-propyl}-N-methyl (1-ethyl)glycine hydrochloride
LC/MS (m/z) 422 (MH+), purity (UV 79%)

3f, Example 7:
N-{3-[1-(4-methylphenyl)-1,3-dihydroisobenzofuran-1-yl]-1-propyl}-N-methylglycine. hydrochloride
LC/MS (m/z) 378 (MH+), purity (UV 91%)

3g, Example 8:
N-{3-[1-(4-fluorophenyl)-1,3-dihydroisobenzofuran-1-yl]-1-propyl}-N-methylglycine hydrochloride
LC/MS (m/z) 344 (MH+), purity (UV 81%)

3h, Example 9

N-{3-[1-(4-fluorophenyl)-1,3-dihydroisobenzofuran-1-yl]-1-propyl}-N-methylalanine hydrochloride

LC/MS (m/z) 358 (MH+), purity (UV 81%)

3i, Example 10

N-{3-[1-(4-fluorophenyl)-1,3-dihydroisobenzofuran-1-yl]-1-propyl}-N-methyl (1-ethyl)glycine hydrochloride

LC/MS (m/z) 372 (MH+), purity (UV 86%)

3j, Example 11

N-{3-[4-chloro-1-(3-methyl-4-fluorophenyl)-1,3-dihydroisobenzofuran-1-yl]-1-propyl}-N-methylglycine hydrochloride.

LC/MS (m/z) 392 (MH+), purity (UV 86%)

3k, Example 12

N-{3-[4-chloro-1-(4-chlorophenyl)-1,3-dihydroisobenzofuran-1-yl]-1-propyl}-N-methylglycine hydrochloride.

LC/MS (m/z) 394 (MH+), purity (UV 98%)

3l, Example 13

N-{3-[5-chloro-1-(4-chlorophenyl)-1,3-dihydroisobenzofuran-1-yl]-1-propyl}-N-methylalanine hydrochloride

LC/MS (m/z) 408 (MH+), purity (UV 85%)

3m, Example 14

N-{3-[6-chloro-1-(4-chlorophenyl)-1,3-dihydroisobenzofuran-1-yl]-1-propyl}-N-methylglycine hydrochloride.

LC/MS (m/z) 394 (MH+), purity (UV 99%)

3n, Example 15

N-{3-[6-chloro-1-(4-methylphenyl)-1,3-dihydroisobenzofuran-1-yl]-1-propyl}-N-methylglycine hydrochloride.

LC/MS (m/z) 374 (MH+), purity (UV 76%)

3o, Example 16

N-{3-[6-chloro-1-(4-methoxyphenyl)-1,3-dihydroisobenzofuran-1-yl]-1-propyl}-N-methylglycine hydrochloride

LC/MS (m/z) 390 (MH+), purity (UV 98%).

3p, Example 17

N-{3-[5-fluoro-1-(4-chlorophenyl)-1,3-dihydroisobenzofuran-1-yl]-1-propyl}-N-methylglycine hydrochloride.

LC/MS (m/z) 378 (MH+), purity (UV 85%).

3q, Example 18

N-{3-[5-fluoro-1-(4-methoxyphenyl)-1,3-dihydroisobenzofuran-1-yl]-1-propyl}-N-methylglycine hydrochloride.

LC/MS (m/z) 378 (MH+), purity (UV 99%).

3r, Example 19

N-{3-[5-trifluoromethyl-1-(4-fluorophenyl)-1,3-dihydroisobenzofuran-1-yl]-1-propyl}-N-methylglycine hydrochloride

LC/MS (m/z) 412 (MH+), purity (UV 81%)

3s, Example 20.

N-{3-[5-trifluoromethyl-1-(4-fluorophenyl)-1,3-dihydroisobenzofuran-1-yl]-1-propyl}-N-methylalanine hydrochloride

LC/MS (m/z) 426 (MH+), purity (UV 98%).

3t, Example 21

N-{3-[5-cyano-1-(3-methyl-4-fluorophenyl)-1,3-dihydroisobenzofuran-1-yl]-1-propyl}-N-methylglycine hydrochloride.

LC/MS (m/z) 383 (MH+), purity (UV 83%).

3u, Example 22

N-{3-[5-cyano-1-(4-cyanophenyl)-indan-1-yl]-1-propyl}-N-methylalanine hydrochloride.

LC/MS (m/z) 388 (MH+), purity (UV 80%).

3v, Example 23

N-{3-[5-cyano-1-(4-methoxyphenyl)-1,3-dihydroisobenzofuran-1-yl]-1-propyl}-N-methylglycine hydrochloride

LC/MS (m/z) 381 (MH+), purity (UV 81%)..

3x, Example 24

N-{3-[5-cyano-1-(4-fluorophenyl)-1,3-dihydroisobenzofuran-1-yl]-1-propyl}-N-methylglycine hydrochloride.

LC/MS (m/z) 369 (MH+), purity (UV 98%)

3y, Example 25

N-{2-[5-cyano-1-(4-fluorophenyl)-1,3-dihydroisobenzofuran-1-yl]ethyl}-N-methylglycine hydrochloride.

LC/MS (m/z) 355 (MH+), purity (UV 94%)

3z, Example 26

N-{3-[5-Chloro-1-(4-chloro-phenyl)-indan-1-yl]-propyl}-N-methylglycine hydrochloride

LC/MS (m/z) 392 (MH+), purity (UV 98%)

3aa, Example 27

N-{3-[5-Chloro-1-(4-chloro-phenyl)-indan-1-yl]-propyl}-N-methylalanine hydrochloride

LC/MS (m/z) 406 (MH+), purity (UV 95%)

3ab, Example 28

N-{3-[3-spirocyclopentyl-1-(4-methylphenyl)-1,3-dihydroisobenzofuran-1-yl]-1-propyl}-N-methylglycine hydrochloride

3ac, Example 29

N-[3-(3,3-Dimethyl-1-phenyl-1,3-dihydro-benzo[*c*]thiophen-1-yl)-propyl]-N-methylglycine hydrochloride

3ad, Example 30

N-[3-(3,3-Dimethyl-1-phenyl-1,3-dihydro-benzo[*c*]thiophen-1-yl)-propyl]-N-methylalanine

LC/MS (m/z) 370 purity (UV 96%)

3ae, Example 32

N-{3-[5-Bromo-1-(4-chlorophenyl)-1,3-dihydroisobenzofuran-1-yl]-1-propyl}-N-methylglycine

LC/MS (m/z) 440 (MH+), purity (ELSD 93%)

3af, Example 33

N-{2-[1-(4-Chloro-phenyl)-3,3-dimethyl-1,3-dihydro-isobenzofuran-1-yl]-ethyl}-N-methylglycine

LC/MS (m/z) 374 (MH+), purity (UV 72%)

3ag, Example 34

N-[3-(3-methyl-1-phenyl-1*H*-inden-1-yl)-propyl]-N-methylglycine

LC/MS (m/z) 336 (MH+), purity (UV 85%)

3ah, Example 35

N-[3-(5-Chloro-1-thiophen-2-yl-1,3-dihydro-isobenzofuran-1-yl)-propyl]-N-methylalanine

LC/MS (m/z) 380 (MH+), purity (UV 85%)

3ai, Example 36

N-[3-(5-Chloro-1-thiophen-2-yl-1,3-dihydro-isobenzofuran-1-yl)-propyl]-N-methyl (1-ethyl)-glycine

LC/MS (m/z) 394 (MH+), purity (UV 80%)

3aj, Example 37

N-[3-(3-methyl-1-phenyl-1,3-dihydro-isobenzofuran-1-yl)-propyl]-N-methylalanine

LC/MS (m/z) 354 (MH+), purity (UV 78%)

3ak, Example 38

N-[2-(3-methyl-1-phenyl-indan-1-yl)-ethyl]-amino}-N-methyl alanine

LC/MS (m/z) 451, purity (UV 92%)

3al, Example 39

N-{3-[1-(4-Chloro-phenyl)-5-(4-methyl-phenyl)-1,3-dihydro-isobenzofuran-1-yl]-ethyl}-N-methyl-glycine

Example 4

4a, N-{3-[5-Bromo-chloro-1-(4-chlorophenyl)-1,3-dihydroisobenzofuran-1-yl]-1-ethyl}-N-methylglycine ethyl ester (226mg, 0.5mmol) was dissolved in a 1:1 mixture of tetrahydrofuran and dimethoxyethane (3 mL) containing tetrakis (triphenylphosphine)palladium under nitrogen. To the reaction was added 4-chlorophenyl boronic acid (102mg, 0.75 mmol) and 0.5M aqueous sodium carbonate solution (2 mL, 1mmol) and the reaction was heated to 65 °C for 18 hours. The solution was diluted with water (5 mL) and ethyl acetate (7 mL). The organic layer was separated and the aqueous layer was re-extracted with ethyl acetate (5 mL). The organic extractions were combined and washed with saturated brine solution (7 mL) before being evaporated in the presence of 1g of silica gel. The crude product absorbed on silica gel was poured on top of a 20g silica gel cartridge and eluted with a gradient solvent system eluting from heptane to heptane/ethyl

acatet (1:1) over 37 minutes. The product was isolated as a light oil (135 mg, 64%). LC/MS 479.

The compound was hydrolysed as described for Experimental 3a to give the N-methyglycine hydrochloride derivative.

LC/MS (m/z) 436, purity (UV 92%)

In an analogous fashion, the following compounds were prepared:

4b, Example 40

N-{3-[1-(4-Chloro-phenyl)-5-(4-methoxy-phenyl)-1,3-dihydro-isobenzofuran-1-yl]-ethyl}-N-methyl-glycine

LC/MS (m/z) 452, purity (UV 94%)

4c, Example 41

N-{3-[1-(4-Chloro-phenyl)-5-(2-thiophenyl)-1,3-dihydro-isobenzofuran-1-yl]-ethyl}-N-methyl-glycine

LC/MS (m/z) 428, purity (UV 96%)

4d, Example 42

N-{3-[1-(4-Chloro-phenyl)-5-(4-methyl-phenyl)-1,3-dihydro-isobenzofuran-1-yl]-propyl}-N-methyl-glycine

LC/MS (m/z) 450, purity 91%

4e, Example 43

N-{3-[1-(4-Chloro-phenyl)-5-(4-methoxy-phenyl)-1,3-dihydro-isobenzofuran-1-yl]-propyl}-N-methyl-glycine

LC/MS (m/z) 466, purity (UV 95%)

4f, Example 44

N-{3-[1-(4-chloro-phenyl)-5-(4-trifluoromethyl-phenyl)-1,3-dihydro-isobenzofuran-1-yl]-propyl}-N-methyl-glycine

LC/MS (m/z) 504, purity (UV 89%)

4g, Example 45

N-{3-[1-(4-Chloro-phenyl)-5-(4-chloro-phenyl)-1,3-dihydro-isobenzofuran-1-yl]-ethyl}-N-methyl-glycine

LC/MS (m/z) 456, purity 96%

4h, Example 46

N-{2-[1-(4-Chloro-phenyl)-5-(5-chloro-thiophen-2-yl)-1,3-dihydro-isobenzofuran-1-yl]-ethyl}-N-methyl-glycine

LC/MS (m/z) 462, purity 74%

4i, Example 47

N-{3-[1-(4-Chloro-phenyl)-5-(3-methyl-phenyl)-1,3-dihydro-isobenzofuran-1-yl]-ethyl}-N-methyl-glycine

LC/MS (m/z) 436, purity UV 94 %

4j, Example 48

N-{3-[1-(4-Chloro-phenyl)-5-(2-methyl-phenyl)-1,3-dihydro-isobenzofuran-1-yl]-ethyl}-N-methyl-glycine

LC/MS (m/z) 436, purity (UV 91%)

4k, Example 49

N-{3-[1-(4-Chloro-phenyl)-5-(2,5-dichloro-phenyl)-1,3-dihydro-isobenzofuran-1-yl]-ethyl}-N-methyl-glycine

LC/MS (m/z) 490, purity 94%

4l, Example 50

N-{3-[1-(4-chloro-phenyl)-5-(3-trifluoromethyl-phenyl)-1,3-dihydro-isobenzofuran-1-yl]-ethyl}-N-methyl-glycine

LC/MS (m/z) 490, purity 89%

4m, Example 51

N-{3-[1-(4-chloro-phenyl)-5-(3-trifluoromethyl-phenyl)-1,3-dihydro-isobenzofuran-1-yl]-propyl}-N-methyl-glycine

LC/MS (m/z) 506, purity 91%

4n, Example 52

N-{3-[1-(4-Chloro-phenyl)-5-(3,4-dichloro-phenyl)-1,3-dihydro-isobenzofuran-1-yl]-ethyl}-N-methyl-glycine

LC/MS (m/z) 490, purity 89%

4o, Example 53

N-{3-[1-(4-Chloro-phenyl)-5-(4-chloro-phenyl)-1,3-dihydro-isobenzofuran-1-yl]-propyl}-N-methyl-glycine

LC/MS (m/z) 470, purity (UV 94%)

4p, Example 54

N-{3-[1-(4-Chloro-phenyl)-5-(3-methyl-phenyl)-1,3-dihydro-isobenzofuran-1-yl]-propyl}-N-methyl-glycine

LC/MS (m/z) 450, purity 96%

4q, Example 55

N-{3-[1-(4-Chloro-phenyl)-5-(2-methyl-phenyl)-1,3-dihydro-isobenzofuran-1-yl]-propyl}-N-methyl-glycine

LC/MS (m/z) 450, purity 93%

4r, Example 56

N-{3-[1-(4-Chloro-phenyl)-5-(2,5-dichloro-phenyl)-1,3-dihydro-isobenzofuran-1-yl]-propyl}-N-methyl-glycine

LC/MS (m/z) 506, purity 91%

4s, Example 57

N-{3-[1-(4-Chloro-phenyl)-5-(3,4-dichloro-phenyl)-1,3-dihydro-isobenzofuran-1-yl]-propyl}-N-methyl-glycine

LC/MS (m/z) 504, purity 95%

4t, Example 58

N-{3-[1-(4-chloro-phenyl)-5-(2-trifluoromethyl-phenyl)-1,3-dihydro-isobenzofuran-1-yl]-propyl}-N-methyl-glycine

LC/MS (m/z) 504, purity 78%

Pharmacological Testing

The compounds of the invention were tested in a well-recognised and reliable test measuring glycine uptake:

[^{3}H]-Glycine uptake

Cells transfected with the human GlyT-1b were seeded in 96 well plates. Prior to the experiment the cells were washed twice in HBS (10 mM Hepes-tris (pH 7,4), 2,5 mM KCl, 1

mM $CaCl_2$, 2,5 mM $MgSO_4$,) and pre-incubated with test compound for 6 minutes. Afterwards, 10 nM ^{3}H-glycine was added to each well and the incubation was continued for 15 minutes. The cells were washed twice in HBS. Scintillation fluid was added and the Plates were counted on a Trilux (Wallac) scintillation counter.

The test results were as follows:

Inhibition of Glycine Transport by hGlyT-

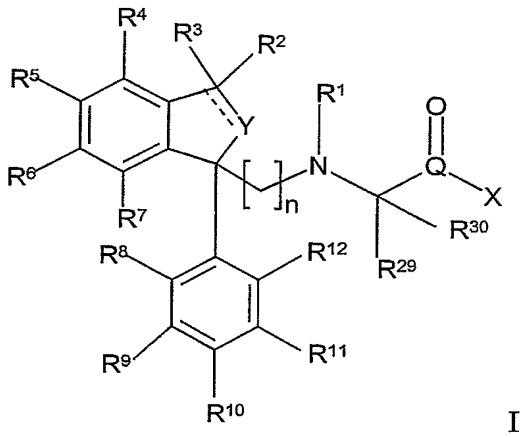
Compound	Compound Name	IC_{50} GlyT-1b
3f	N-{3-[1-(4-methylphenyl)-1,3-dihydroisobenzofuran-1-yl]-1-propyl}-N-methylglycine.	5400
3k	N-{3-[4-chloro-1-(4-chlorophenyl)-1,3-dihydroisobenzofuran-1-yl]-1-propyl}-N-methylglycine.	4100
3l	N-{3-[5-chloro-1-(4-chlorophenyl)-1,3-dihydroisobenzofuran-1-yl]-1-propyl}-N-methylalanine	5500
3m	N-{3-[6-chloro-1-(4-chlorophenyl)-1,3-dihydroisobenzofuran-1-yl]-1-propyl}-N-methylglycine.	7200
3n	N-{3-[6-chloro-1-(4-methylphenyl)-1,3-dihydroisobenzofuran-1-yl]-1-propyl}-N-methylglycine.	9600
3t	N-{3-[5-cyano-1-(3-methyl-4-fluorophenyl)-1,3-dihydroisobenzofuran-1-yl]-1-propyl}-N-methylglycine.	5700
3v	N-{3-[5-cyano-1-(4-methoxyphenyl)-1,3-dihydroisobenzofuran-1-yl]-1-propyl}-N-methylglycine	8600
3z	N-{3-[5-Chloro-1-(4-chloro-phenyl)-indan-1-yl]-propyl}-N-methylglycine	1100
3aa	N-{3-[5-Chloro-1-(4-chloro-phenyl)-indan-1-yl]-propyl}-N-methylalanine	470
3ae	N-{3-[5-Bromo-1-(4-chlorophenyl)-1,3-dihydroisobenzofuran-1-yl]-1-propyl}-N-methylglycine	4000

3af	N-{2-[1-(4-Chloro-phenyl)-3,3-dimethyl-1,3-dihydro-isobenzofuran-1-yl]-ethyl}-N-methylglycine	3500
3ak	N-[2-(3-methyl-1-phenyl-indan-1-yl)-ethyl]-amino}-N-methyl alanine	2200
3al	N-{3-[1-(4-Chloro-phenyl)-5-(4-methyl-phenyl)-1,3-dihydro-isobenzofuran-1-yl]-ethyl}-N-methyl-glycine	2200
4c	N-{3-[1-(4-Chloro-phenyl)-5-(2-thiophenyl)-1,3-dihydro-isobenzofuran-1-yl]-ethyl}-N-methyl-glycine	1200
4d	N-{3-[1-(4-Chloro-phenyl)-5-(4-methyl-phenyl)-1,3-dihydro-isobenzofuran-1-yl]-propyl}-N-methyl-glycine	1500
4j	N-{3-[1-(4-Chloro-phenyl)-5-(2-methyl-phenyl)-1,3-dihydro-isobenzofuran-1-yl]-ethyl}-N-methyl-glycine	710
4k	N-{3-[1-(4-Chloro-phenyl)-5-(2,5-dichloro-phenyl)-1,3-dihydro-isobenzofuran-1-yl]-ethyl}-N-methyl-glycine	950

The above results demonstrate that the compounds of the invention are able to inhibit glycine uptake into synaptosomes in micromolar concentrations

Claims:

1. A compound represented by the general formula I



I

wherein

R^1 represents hydrogen, C_{1-6}-alkyl, cycloalkyl or cycloalkylalkyl;

R^2 and R^3 independently represent hydrogen, halogen, C_{1-6}-alkyl, C_{3-8} cycloalkyl or C_{3-8} cycloalkyl-C_{1-6}-alkyl or R^2 and R^3 together form a C_{3-8} cycloalkyl;

R^4, R^5, R^6 and R^7 independently represent hydrogen, halogen, CF_3, NO_2, CN, C_{1-6} alkyl, C_{2-6} alkenyl, C_{2-6} alkynyl, C_{3-8} cycloalkyl, C_{1-6} alkoxy, C_{1-6} alkylthio, OH, SH, $NR^{14}R^{15}$, wherein R^{14} and R^{15} independently represent hydrogen or C_{1-6}-alkyl; $-COR^{16}$ wherein R^{16} represents OH, C_{1-6}-alkyl, C_{1-6}-alkoxy, $NR^{17}R^{18}$, wherein R^{17} and R^{18} independently represent hydrogen or C_{1-6}-alkyl; aryl or heteroaryl, wherein aryl and heteroaryl are optionally substituted one or more times with halogen, CF_3, OCF_3, CN, NO_2, C_{1-6} alkyl, C_{2-6} alkenyl, C_{2-6} alkynyl, C_{3-8} cycloalkyl, C_{1-6} alkoxy, C_{1-6} thioalkyl, OH, SH or $NR^{24}R^{25}$, wherein R^{24} and R^{25} independently represent hydrogen or C_{1-6}-alkyl;

or R^4 and R^5, or R^5 and R^6, or R^6 and R^7 together form a fused, aromatic, saturated or partly saturated ring which optionally contains one or more heteroatoms such as O, N or S;

R^8, R^9, R^{10}, R^{11}, and R^{12} independently represent hydrogen, halogen, CF_3, OCF_3, CN, NO_2, C_{1-6} alkyl, C_{2-6} alkenyl, C_{2-6} alkynyl, C_{3-8} cycloalkyl, C_{1-6} alkoxy, C_{1-6}-alkylthio, OH, SH, $NR^{19}R^{20}$, wherein R^{19} and R^{20} independently represent hydrogen or C_{1-6}-alkyl; or R^8, R^9, R^{10}, R^{11} and R^{12} independently represent $-COR^{21}$, wherein R^{21} represents OH, C_{1-6}-alkoxy, $NR^{22}R^{23}$ wherein R^{22}

and R^{23} independently represent hydrogen or C_{1-6}-alkyl; or R^8, R^9, R^{10}, R^{11} and R^{12} independently represent aryl or heteroaryl, wherein aryl and heteroaryl are optionally substituted one or more times with halogen, CF_3, OCF_3, CN, NO_2, C_{1-6} alkyl, C_{2-6} alkenyl, C_{2-6} alkynyl, C_{3-8} cycloalkyl, C_{1-6} alkoxy, C_{1-6} alkylthio, OH, SH, COR^{26}, wherein R^{26} represents OH, C_{1-6} alkoxy or C_{1-6} alkyl; or $NR^{30}R^{31}$, wherein R^{30} and R^{31} independently represent hydrogen or C_{1-6}-alkyl;

R^8 and R^9, or R^9 and R^{10}, or R^{10} and R^{11}, or R^{11} and R^{12} together form a fused, aromatic, saturated or partly saturated ring which optionally contains one or more heteroatoms such as O, N or S;

Y is O, S, CH_2 or CH, and when Y is CH then the dotted line is a bond;

n is 2, 3, 4, 5 or 6;

Q represents C, P-OR^{29} or S=O, wherein R^{29} represents hydrogen or C_{1-6}-alkyl;

X is OR^{13} or $NR^{27}R^{28}$, wherein R^{13}, R^{27}, and R^{28} independently represent hydrogen, C_{1-6}-alkyl, aryl or aryl-C_{1-6}-alkyl, wherein aryl may be substituted with halogen, CF_3, OCF_3, CN, NO_2, or C_{1-6} alkyl; Optionally R^{27} and R^{28} together form a ring which may contain further nitrogen, oxygen or sulfur atoms and the ring may optionally be partly saturated,

R^{29} and R^{30} represent hydrogen, C_{1-6}-alkyl, cycloalkyl or cycloalkylalkyl;

or a pharmaceutically acceptable addition salt thereof.

2. The compound according to any of the preceding claims, wherein n is 2 or 3.
3. The compound according to any of the preceding claims, wherein R^1 is CH_3.
4. The compound according to any of the preceding claims, wherein Q is C.
5. The compound according to any of the preceding claims, wherein X is OH or C_{1-6}-alkoxy.
6. The compound according to any of the preceding claims, wherein R^7 represents hydrogen, and R^4, R^5 or R^6 represent hydrogen, C_{1-6}-alkyl, CN, halogen, CF_3 or phenyl optionally substituted one or more times with halogen, C_{1-6}-alkyl, C_{1-6}-alkoxy, CF_3, or R^4, R^5 or R^6 represent heteroaryl optionally substitutted one or more times with halogen or wherein R^4 and R^5, or R^5 and R^6 together form a fused aryl.

7. The compound according to any of the preceding claims wherein R^8, R^9, R^{10}, R^{11} or R^{12} independently represent hydrogen, halogen, alkyl, alkoxy, or R^8 and R^9, or R^9 and R^{10} together form a fused aryl.

8. The compound according to any of the preceding claims wherein R^8, R^9, R^{10}, R^{11} or R^{12} independently represent halogen, C_{1-6}-alkyl, C_{1-6}-alkoxy.

9. A pharmaceutical composition comprising at least one compound according to any of the preceding claims, or a pharmaceutically acceptable acid addition salt thereof in a therapeutically effective amount and in combination with one or more pharmaceutically acceptable carriers or diluents.

10. The use of a compound according to claims 1-8, for the manufacture of a medicament for the treatment of diseases responsive to modulation of the glycine transporter.

11. The use according to claim 10 wherein the disease is responsive to antagonism of the glycine transporter;

12. The use according to claims 10 and 11, wherein the disease is selected from the group consisting of the positive and the negative symptoms of schizophrenia, psychoses, dementia, pain, improving cognition, Alzheimer's disease, multi-infarct dementia, AIDS dementia, Huntington's disease, Parkinson's disease, amyotrophic lateral sclerosis or diseases wherein the brain is damaged by inner or outer influence, such as trauma to the head or stroke.

13. A method for the treatment of a disease responsive to modulation of the glycine transporter by administering to a patient in need thereof, an effective amount of a compound according to claims 1-8.

14. The method according to claim 13 wherein the diseases are responsive to antagonism of the glycine transporter.

15. The method according to claims 13 and 14, wherein the diseases to be treated are selected from the group consisting of the positive and the negative symptoms of schizophrenia, psychoses, dementia, pain, improving cognition, Alzheimer's disease, multi-infarct dementia, AIDS dementia, Huntington's disease, Parkinson's disease, amyotrophic lateral sclerosis or diseases wherein the brain is damaged by inner or outer influence, such as trauma to the head or stroke.

INTERNATIONAL SEARCH REPORT

Internauonal application No.
PCT/DK 01/00510

A. CLASSIFICATION OF SUBJECT MATTER

IPC7: C07D 307/87, C07D 333/72, C07C 229/02, C07C 211/03, A61K 31/343, A61K 31/381, A61K 31/198, A61P 25/00

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC7: C07D, C07C

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-INTERNAL, WPI DATA, PAJ, CHEM.ABS.DATA

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	GB 1166711 A (KEFALAS A/S), 8 October 1969 (08.10.69), the claims, the examples --	1-15
X	STN International, file CAPLUS, CAPLUS accession no 1970:90271, document no 72:90271, Kefalas A/S: "Antidepressant thiophthalanes", & ZA,6800199,19690711 --	1-15
X	WO 0034263 A1 (H. LUNDBECK A/S), 15 June 2000 (15.06.00) --	1-15
X	US 4136193 A (BOGESO ET AL), 23 January 1979 (23.01.79) --	1-15

[X] Further documents are listed in the continuation of Box C. [X] See patent family annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance: the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
29 October 2001	30 -10- 2001
Name and mailing address of the ISA/ Swedish Patent Office Box 5055, S-102 42 STOCKHOLM Facsimile No. +46 8 666 02 86	Authorized officer Gerd Strandell/BS Telephone No. +46 8 782 25 00

Form PCT/ISA/210 (second sheet) (July 1998)

INTERNATIONAL SEARCH REPORT

International application No.
PCT/DK 01/00510

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
P,X	Journal of Analytical Toxicology, Vol 24, No 5, 2000, Hans H. Maurer et al. "Screening Procedure for Detection of Antidepressants of the Selective Serotonin Reuptake Inhibitor Type and their Metabolites in Urine as Part of a Modified Systematic Toxicological Analysis Procedure using Gas Chromatography-Mass Spectrometry", pages 340-347, page 343, A-G	1-15
X	Acta Pharmacologica et toxicologica, Vol 32, (1973): 3-4, pages 278-284, B. Fjalland et al: "Anti-Nociceptive Activity of Some Thiophthalanes with Morphine-like Properties"	1-15
X	J. Org. Chem., Vol 36, No 5, 1971, W.L. Matier et al: "Novel Cyclizations and Ring-Opening Reactions of 3-Phenylindene Derivatives" pages 650-654, page 650, left column, first paragraph, page 651, compound 10, page 653, right column	1-8
P,A	WO 0103694 A1 (H. LUNDBECK A/S), 18 January 2001 (18.01.01)	1-15
A	J. Chem. Soc.(C), Vol 10, 1971, M.V. Bhatt et al: "Aspects of Tautomerism. Part II Reactions of the Pseudo-acid Chloride of o-Benzoylbenzoic Acid with Nucleophiles", page 1772-1777, page 1776 - page 1777, RN 32524-77-9, 32557-56-5	1-15

INTERNATIONAL SEARCH REPORT

International application No.
PCT/DK01/00510

Box I **Observations where certain claims were found unsearchable (Continuation of item 1 of first sheet)**

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☒ Claims Nos.: 13-15
because they relate to subject matter not required to be searched by this Authority, namely:

see next sheet

2. ☐ Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box II **Observations where unity of invention is lacking (Continuation of item 2 of first sheet)**

This International Searching Authority found multiple inventions in this international application, as follows:

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:

4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

☐ The additional search fees were accompanied by the applicant's protest.

☐ No protest accompanied the payment of additional search fees.

Claims 13-15 relate to methods of treatment of the human or animal body by surgery or by therapy/ diagnostic methods practised on the human or animal body/Rule 39.1.(iv). Nevertheless, a search has been executed for these claims. The search has been based on the alleged effects of the compounds/compositions.

INTERNATIONAL SEARCH REPORT

International application No.
PCT/DK 01/00510

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
GB 1166711 A	08/10/69	CH 491076 A	31/05/70
		DE 1618583 A	23/12/70
		DK 124820 B	27/11/72
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		NL 6704297 A	29/09/67
		NO 127052 B	30/04/73
		SE 338564 B	13/09/71
WO 0034263 A1	15/06/00	AU 1503600 A	26/06/00
		NO 20012802 A	07/08/01
		BR 9916873 A	21/08/01
US 4136193 A	23/01/79	AT 359488 B	10/11/80
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		NO 770109 A	15/07/77
		NZ 183001 A	02/06/78
		SE 429551 B,C	12/09/83
		SE 7614201 A	15/07/77
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WO 0103694 A1	18/01/01	AU 5806100 A	30/01/01